Station.	Latitude N.	Longitude W. of Greenwich.	g_1, reduced to sea level.	g_0, theoretical value.	$g_1 - g_0$.
	° ′	° ′	cm.	cm.	cm.
Washington ...	38 53	77 1	980·101	980·087	+ 0·014
Sydney (Cape Breton) ...	46 9	60 12	980·722	980·732	− 0·010
Ashe Inlet ...	62 33	70 35	982·109	982·104	+ 0·005
Umanak ...	70 40	52 8	982·594	982·632	− 0·038
Niantilik ...	64 53	66 20	982·275	982·271	+ 0·004

The theoretical value is that given by the assumed formula,

$$g_0 = 978{\cdot}066\ (1 + 0{\cdot}005243 \sin^2 \text{latitude}),$$

and g_1 is obtained by using Bouguer's formula.

It would not be easy to over-estimate the value of these accurate determinations of gravity, for they help to fill a very serious gap in the series of observations which have been made in various parts of the world. Prof. Helmert's recent report to the International Geodetic Association has shown that no pendulum observations had been obtained in the region visited by Mr. Putnam, and it is in the polar regions that data as to the variations of gravity are of the greatest importance and, therefore, most urgently required. Mr. Putnam concludes his report with some historical notes on the development of apparatus and the progress of research, which are very interesting. It is hardly correct, however, to say that the law $t = \pi \sqrt{\frac{l}{g}}$ applies even to the ideal simple pendulum (p. 110). These notes contain a good account of the controversy which has arisen about the appropriateness of the second term in Bouguer's formula for the reduction of g to sea level: $dg = \frac{2gH}{r}\left(1 - \frac{3\delta}{4\Delta}\right)$, where δ is density of matter lying above sea level, and Δ is the mean density of the earth. The value of pendulum observations as affording indications of surface density is insisted upon, and a practical application of the method is suggested. It is to be hoped that Mr. Putnam will see his project realised, by which the relative proportions of ice and rock in the great Greenland elevation may be determined by pendulum experiments.

RAINFALL OF THE UNITED STATES.

UNDER this title the Weather Bureau of the Department of Agriculture has published a bulletin containing a discussion of the observations obtained from the longest and most trustworthy rainfall registers in the United States, accompanied by annual, seasonal, and other charts. In addition to the usual tables of the mean monthly and annual precipitation, arranged according to geographical distribution, an important departure has been made by separately discussing the rainfall of the crop-growing season; for, as the author remarks, however valuable a knowledge of the water supply throughout the year may be, information as to the amount of rainfall available for agricultural purposes is possibly of greater consequence.

Another departure from the ordinary treatment of the subject is the discussion of the monthly distribution by districts and types according to natural boundaries. The conditions favourable for rainfall are chiefly (1) nearness to the ocean, (2) proximity to the track of storms, and (3) the position of mountain ranges. The rainfall of the North Pacific coast is quoted as an example of the combined effect of all three conditions, the distinguishing characteristic of this type being a wet season from October to March, and a practically rainless summer, except in Northern California and parts of Oregon and Washington. About half of the yearly fall occurs between December and February. The rainfall is discussed under twelve such types; we are unable to refer specially to each of these, but the chart of mean annual precipitation shows that there is a narrow belt on the north-west coast, extending from Cape Flattery on the north to midway of the Oregon coast on the south, and some distance inland, where the annual amount exceeds 50 and at some points 100 inches. Eastward and southward the annual fall diminishes, reaching a minimum on the lowlands and valleys between the Coast Range on the west and the Sierra Nevada and the Cascade Ranges on the east, where the amount in some cases does not exceed 10 inches, but in years of plentiful rainfall as much as 20 inches may fall in the best-watered parts. At Terrace (Utah), a station on the Central Pacific Railroad, the mean annual fall is only 4·3 inches, and in the driest year was as low as 0·7 inch. To the eastward of the Rocky Mountains the annual fall is from 10 to 18 inches, and increases slowly to 60 inches on the Florida and Gulf coasts, and from 40 to 50 inches in the Eastern States. There is, however, a gradual decline both from the Atlantic coast westward and from the Gulf coast northward. In considering the various rainfall values in this discussion allowance must he made for the position of the gauges which are generally exposed on roofs, owing to the stations being mostly in towns. It is well known that the amount caught in the gauge decreases with altitude above the ground, and it is estimated that the loss from this cause in the values quoted by the Weather Bureau is from 5 to 10 per cent. of the total annual fall. With regard to the important subject of excessive rainfall, down to the year 1888 only one self-recording gauge was in use at the Signal Service stations; five others were added in 1889, and the publication in the *Monthly Weather Review* of the maximum falls in five and ten minutes, and also in one hour, were begun. In August 1890 a cloud-burst passed over Palmetto (Nevada), when a gauge that was not exposed to the full intensity of the storm caught 8·8 inches of water in an hour, and in August 1891, 11½ inches were measured within an hour at Campo (California). The great majority of excessive rains are said to occur east of longitude 105° W., and principally in the summer months, in connection with afternoon thunderstorms; they occasionally take place in the track of West India hurricanes, and are more abundant on the Gulf and South Atlantic coasts than at inland places. The maximum rates of rainfall per hour, estimated from periods of five minutes, at the Weather Bureau Stations which possess self-registering gauges, were 9 inches at Bismarck (N. Dakota); 8·4 inches at St. Paul (Wisconsin), and 8·2 inches at New Orleans.

This valuable memoir has been prepared by Mr. A. J. Henry, under the direction of Prof. Willis L. Moore, the Chief of the Weather Bureau.

NOTES.

THE German Emperor, as King of Prussia, has conferred upon Dr. John Murray, Director of the Scottish Marine Station, and formerly of the *Challenger* expedition, the rare distinction of knighthood in the Order *Pour le Mérite* founded by Frederick the Great. This is generally allowed to be the highest honour which a man of science can receive, and is limited to thirty German and twenty-five foreign knights. Lord Kelvin, Lord Lister, and Sir G. G. Stokes are the only other British men of science now alive who have received the Order. Dr. Murray has also been elected a Foreign Member of the Imperial Russian Academy of Sciences.

THE Committee appointed by the American Society of Naturalists to inquire into the practicability and feasibility of the exploration of the Antarctic continent, report that an expenditure of from forty thousand to fifty thousand dollars would suffice for an independent scientific expedition. The Committee suggests that if this fund could not be raised by public subscription, a number of scientific societies and institutions of general learning, should contribute the amount required, each sending representatives to the expedition in proportion to the sums subscribed.

WE are glad to hear that the Zoological Society of London has contributed 100*l.* towards the expenses of the International Congress of Zoology; and we hope to hear that other natural history societies have followed this excellent example.

SIR DYCE DUCKWORTH has been appointed to deliver the Harveian Oration before the Royal College of Physicians of London for 1898. Dr. G. V. Poore has been nominated Milroy Lecturer for 1899.

THE Council of the Institution of Civil Engineers have resolved that the "Engineering Conference," inaugurated in 1897, is to be biennial, and that, accordingly, the next meeting will be held in London in the spring of 1899.

A LARGE and representative Royal Commission has been appointed to advise as to the best means by which the products of British industry, agriculture, and the fine arts may be procured and sent to the International Exhibition to be held at Paris in the year 1900. Among the Commissioners, which include the Prince of Wales and the Duke of York, are the following representatives of science and the arts, in alphabetical order:—Sir F. A. Abel, Sir George Birdwood, Major-General Sir Owen Tudor Burne, Sir G. H. Chubb, Major-General Sir John Donnelly, Lord Kelvin, Sir James Kitson, Sir Trevor Lawrence, Lord Lister, Sir John Lubbock, Sir Clements Markham, Mr. W. H. Preece, Mr. E. Windsor Richards, Earl Spencer, Mr. W. T. Thiselton-Dyer, Sir E. Maunde Thompson, and Sir W. H. White.

M. FRANCHET has been elected President of the Botanical Society of France for the current year; MM. Zeiller, Boudier, Clos, and Roze Vice-Presidents.

PROF. O. MATTIROLO, of Bologna, has been appointed Professor of Botany and Director of the Museum and Botanical Garden at Florence; Prof. F. Morini, of Messina, takes his place at Bologna.

ON December 18, 1897, a hall was opened at Bologna for the reception of the herbaria, preparations, and sections of the botanist Aldrovandi. It has been erected at the cost of the city and province.

THE part of *Malpighia* comprising fascs. 9 and 10 for the year 1897, edited by Prof. O. Penzig, contains a view of the very handsome monument erected to the memory of Malpighi at Crevalcore.

THE post of Government botanist to Victoria, vacant by the death of Baron Ferdinand v. Müller, has been conferred on Mr. J. G. Luchman.

THE death is announced of Dr. Waldemar v. Schroeder, professor of pharmacology in the University of Heidelberg, and author of a number of treatises on physiological chemistry.

WE learn from *Science* that the Bruce gold medal of the Astronomical Society of the Pacific has been awarded to Prof. Simon Newcomb, for his distinguished services to astronomy.

THE American Academy of Arts and Sciences has elected M. Elias Metschnikoff, of Paris, Foreign Honorary Member in the Section of Zoology and Physiology.

THE twenty-sixth general meeting of the Federated Institution of Mining Engineers will be held at Newcastle-upon-Tyne on February 22 and 23.

AT the annual general meeting of the Royal Horticultural Society, held on Tuesday, the Council announced that they had appointed the Rev. George Henslow to be professor of botany to the Society, and that Prof. Henslow had kindly undertaken to give addresses at a number of the 1898 meetings, drawing attention to interesting points connected with some of the plants, &c., exhibited. The Council believe that these "demonstrations" will be greatly appreciated by the Fellows of the Society.

AT the general monthly meeting of the members of the Royal Institution, on Monday, the special thanks of the members were returned to Mrs. Tyndall for her liberal donation of 1000*l.*, presented in the name of the late Prof. Tyndall, for the promotion of science Thanks were also returned to Sir Frederick Abel, Sir Andrew Noble and Prof. Dewar for donations to the fund for the promotion of experimental research at low temperatures. It was announced that the centenary of the Royal Institution would be celebrated next year.

THE meeting of the Manufacturers' Association of America at New York, on January 25-27, was the most notable gathering of the masters of industry ever held in America, or probably in the world. It was estimated that the 966 persons who attended the closing banquet represented industries which produce 9,000,000,000 dollars of manufactures annually. In the meetings of the Association prior to the banquet the subject of the metric system was presented by the committee, together with a resolution strongly favouring it; which resolution met with support from many of the most influential members of the Association, but was opposed by the chairman of the committee on the grounds of the expense of making new gauges and tools in changing from the present standard. The final result was that the resolution was not carried.

FURTHER particulars of Prof. O. C. Marsh's valuable gift to Yale University (see p. 322) are given in the *Yale Alumni Weekly*. From a scientific point of view, the value of the collections now presented to Yale is beyond price, each one containing many specimens that can never be duplicated, and are already of historical interest in the annals of science. Among the prominent features of one of these collections, that of extinct Vertebrates, may be mentioned (1) the series of fossils illustrating the genealogy of the horse, as made out by Prof. Marsh, and accepted by Huxley, who used it as the basis of his New York lectures; (2) the birds with teeth, nearly two hundred individuals, described in Prof. Marsh's well-known monograph "Odontornithes"; (3) the gigantic Dinocerata, several hundreds in number, Eocene mammals described in his monograph on this group; (4) the Brontotheridæ, huge Miocene mammals, some two hundred in number; (5) Pterodactyles, or flying dragons, over six hundred in number; (6) the Mosasaurs, or Cretaceous sea-serpents, represented by more than fifteen hundred individuals; (7) a large number of Dinosaurian reptiles, some of gigantic size. Besides these are various other groups of mammals, birds, and reptiles, most of them including unique specimens.

IN referring to the priceless collections which have now become the property of Yale University, by Prof. Marsh's generosity, the *Alumni Weekly* remarks that Prof. Marsh is a Yale graduate of the Class of 1860. He is a nephew of the late George Peabody, and thus he secured the donation that gave Yale the present Peabody Museum, as well as a reserve building fund that then seemed adequate for future additions. After obtaining this great gift for Yale, Prof. Marsh served his *alma mater* faithfully, without salary, for thirty years, as professor of palæontology, refusing all offers to go elsewhere. Besides bringing together with untiring zeal these vast scientific collections now presented to the University, Prof. Marsh has found time to describe many of the important specimens new to science, and make them known to the world in more than two hundred and fifty publications.

WE have been requested to announce that it is proposed to raise, by international subscription, a memorial fund to the late Prof. Edmund Drechsel, the well-known physiological chemist, whose recent death at Naples, on September 22, 1897, has been a great loss to science. Prof. Drechsel has left a widow and two young sons in very poor circumstances. It is hoped that sufficient money will be raised to contribute materially to the support and education of these boys, as well as to provide a modest memorial to Drechsel in the place where he is buried. Any contribution to this object may be sent direct to Prof. Kronecker, Physiologisches Institut, Bern; or to Mr. Ernest H. Starling, 8 Park-square, London, N.W., who will forward any subscriptions received to Prof. Kronecker. This appeal has been circulated among the members of the Physiological Society; but Drechsel was even more a chemist than a physiologist, and many English chemists, as well as other scientific men, may be glad to contribute in some way to the memorial which is being raised on behalf of his widow and children.

WITH reference to the recrudescence of epidemic influenza the *British Medical Journal* says:—Influenza has further increased in London during the past week, and medical practitioners in all parts of the town are finding their hands very full. The epidemic seems to be very prevalent also in some of the home counties, especially in Kent and Surrey, and it prevails also in Devonshire and Cornwall. The epidemic now prevalent, in some districts at least, differs in its character from those from which we have suffered in previous years. It has long been recognised that the disease may present at least three distinct types, according to whether it attacks most severely the respiratory, the nervous, or the digestive systems. In the earlier epidemics in recent years the majority of cases belonged to the first type, and many deaths were caused by bronchitis and pneumonia. Later, the prevalent type was the nervous, and men were left in a condition of mental and physical depression which for many months greatly limited their activities, and in too many cases helped to fill the asylums. The present epidemic is remarkable for the very large proportion of cases which show symptoms of profound disturbance of the digestive system.

IT is surprising that in a subject like mathematics, where any student may easily rediscover known theorems for himself, so few journals exist devoted to the interchange of notes and queries. We are glad to see that *L'Intermédiaire des Mathématiciens*, which exactly fulfils this object, has now entered on its fifth year of publication. The editors, Dr. C. A. Laisant and M. Émile Lemoine, justly take pride to themselves in recording that the recent Mathematical Congress in Zürich owed its origination partly to correspondence in their columns.

A NOTE by Commander C. H. Davis in *Terrestrial Magnetism*, calls attention to the serious effects of electric car disturbances at the magnetic observatory of the United States Naval Observatory, which is situated on Georgetown Heights, in the suburbs of Washington. The disturbances seem to have most affected the vertical force, but the horizontal force and declination were also disturbed. Experiments conducted at the magnetic observatory of Toronto, which is still in a worse predicament than this observatory, show that magnetic instruments must be removed to a distance of at least two miles before the disturbances of an electric railway cease to be apparent. Observations at Toronto have been discontinued. As Commander Davis remarks, it thus appears that the use of powerful electric currents for commercial purposes has destroyed the usefulness of the only two magnetic observatories on the North American continent.

THE *Aeronautical Journal*, which now enters on its second year of publication, bids fair to be a current record of all experiments on aeronautical matters as well as of devices, both practicable and impracticable, for navigating the air. Among the features of the current number are an account of Mr. Chanute's American experiments, and a translation of a paper, by Captain Moedebeck, on the German aluminium balloon which was experimented with on November 3 of last year, but was wrecked through becoming unmanageable. That never failing subject of controversy, the "soaring bird," is again brought forward, this time in a lengthy disquisition by Mr. G. L. O. Davidson. Mr. P. Spencer describes Mr. Pollock's balloon trip of October 12, 1897, across the Channel; and Mr. A. Lawrence Rotch, of the Blue Hill Observatory, contributes a note on "The Highest Kite Ascent." A glance at the list of patents applied for, and actually granted, will show that the "dark ages" of science have not yet entirely disappeared, so far as aeronautics is concerned.

A SMALL pamphlet, entitled "Natural Colour Photographs," has been received from the Natural Colour Photography Company, Ltd., Dublin; and though Prof. Joly's name is not mentioned in it, the process described is evidently the one we owe to his ingenuity. This process, it will be remembered, consists in using two screens: one—the "taking" screen—lined in orange, yellowish-green and blue; and the other—the "viewing" screen—lined in red, green and violet. The pamphlet just received is taken up with directions for using these screens, the former of which is employed to obtain the negative, while the latter—when superimposed upon the positive finally obtained—reproduces the colours of the original object, which appears as a transparent photographic image in the natural colours. Many photographers will be glad to know where to procure these screens, and how to obtain the best results with them.

AT the meeting of the Academy of Sciences at Vienna, on January 20, Dr. J. Hann communicated a treatise on the theory of the daily oscillation of the barometer. The chief object of the discussion is the investigation of that portion of the regular oscillation of the barometric pressure which occurs once in an entire day. This period is most subject to disturbances of locality and time because all meteorological phenomena have a whole-day period. With the view of eliminating all disturbing influences as much as possible, the author deals with the hourly observations made at sea, and on islands far from continents. Near the equator the extremes of the whole-day period occur near 5h. 30m. a.m. (the maximum) and 5h. 30m. p.m. (the minimum), which are not very different from the average conditions on land, the epochs being retarded with increase of latitude. The amplitude of the whole-day oscillation at the equator is nearly a third of that of the double daily variation. The amplitudes of the daily wave have two principal maxima at the time of the equinoxes, and a principal minimum in June and July, at the time of aphelion; while in December and January, at the time of perihelion, the amplitude is much greater. The author also investigates, for a number of stations, the modifications to which the normal whole-day wave of barometic pressure is subject, owing to the daily periodic transfer of masses of air from land to sea, and the reverse, as well as at mountain stations.

THE Hong Kong Observatory seems to have been originally founded for the purpose of issuing storm warnings and protecting commerce against the destructive typhoons which visit those parts. Looked at from that point of view the Observatory seems to have fulfilled its original object. The Report for 1896, just received, gives a full account of the work carried on, and particularly analyses the relative success that has attended the weather and storm predictions issued. Adopting the general method of taking the sum of total and partial successes as a measure of success, and similarly with the failures, we learn that 97 per cent. of the weather forecasts have been justified. With regard to the success in predicting the approach of a typhoon, the percentage is nearly as good, if we leave out of account a peculiar storm, prevalent in the winter, called a "Norther," and of which it is impossible to publish any forecast till information is available from the interior of China and the northern ports. For instance, there appears to be no telegraphic communication between the Observatory and either Hankow or Cheefoo, so that all information from a particular direction is wanting, which, if it could be obtained, would add materially to the safety of the shipping and commerce. But notwithstanding these disadvantageous circumstances, the percentage of success is 75 for all gales, and leaving out those for whose successful prediction northern information is necessary, the percentage is as high as 83. Among the original inquiries prosecuted at the Observatory is one on anemometer records at various altitudes. Two Robinson anemometers of identical construction are mounted at 150 feet and 1834 feet above mean sea-level. The lower is at the Observatory on the Chinese mainland, the higher on the island of Hong Kong. The result is to show the ratio between the force of the wind at the two stations for each hour of the day throughout the year. In the summer, when the wind is generally southerly, the proportionate velocity is greater than in winter, when the wind is easterly. Similarly at midnight, and the morning hours, the difference of velocity is greater than at noon, and the hours immediately after.

THE *Pharmaceutical Journal* is doing its best to encourage the use of the metric system by pharmacists in their daily business. Recent legislation has made the use of the system legal in British commerce, but, as our contemporary points out, the mischief of a permissive system is that what is permitted is often, as a matter of convenience, ignored; and there is little doubt that the mere permission to use metric weights and measures in trade will prove futile in encouraging the general adoption of the system. The suggestion is offered, therefore, that pharmacists should neglect no opportunity of familiarising themselves, and those with whom they come in contact in the course of their business, with the more rational weights and measures that are now legal, the more especially as they appear destined, sooner or later, to supplant the older weights and measures entirely. With the view of encouraging and assisting the reform indicated, it is proposed in future to give all quantities in the pages of the *Pharmaceutical Journal* in accordance with the metric system, and the change will be effected in its entirety at as earlier a period as may prove convenient. After the new Pharmacopœia is published, there will be no excuse for British pharmacists to plead unfamiliarity with the metric system.

AMONG the more valuable incidental results of the Canadian meeting of the British Association must be reckoned the advances in our knowledge of the surface life of the North Atlantic, made by members of the Association during their outward and homeward voyages. We have referred in earlier numbers to the collections of plankton made by Prof. Herdman along the Canadian transatlantic route, and by Mr. Garstang along the Canadian and American routes. Prof. Herdman's account of his work is the first to appear, and has been published as a memoir in the *Transactions* of the Liverpool Biological Society (vol. xii.), under the joint authorship of Prof. Herdman, Mr. J. C. Thompson, and Mr. Andrew Scott. The memoir reveals a remarkably wide distribution for the majority of the forms enumerated. Four new species of Copepoda are described, three of them from the St. Lawrence and one from Puget Sound on the Pacific Coast. The discovery of these forms by English visitors should encourage Canadian naturalists to take up this promising field of research for themselves.

IN order to obtain positive data as to the results of the serum treatment of diphtheria in Russia, the two St. Petersburg societies, of Children's Physicians and of Russian Physicians, nominated a special committee which studied all that had hitherto been printed in Russia on the subject, and entered into correspondence with the doctors who had used serum in their practice. An elaborate report of the committee was read, on December 24 last, by Dr. Rauchfuss before a meeting of the Society of Russian Physicians. In 44,631 registered diphtheria cases in which serum was used, the mortality was only 14·6 per cent., while in 6507 cases where no serum was used, the mortality was more than double, *i.e.* 34 per cent. By a careful analysis of data taken from 51 provinces of Russia, Dr. Rauchfuss shows that in each province separately the serum treatment had the effect of at once notably reducing the mortality, even in the midst of severe epidemics. He does not deny that medical help is now applied for in a number of lighter cases, in which no doctor would have been called for a few years ago; but the marked difference between the mortality in the cases which were treated with serum and those which were not, cannot be explained in this way, while the confidence of the population, including the peasants, in the new treatment is also a testimony in favour of it. Eleven laboratories situated in different parts of Russia are now preparing diphtheria serum.

IT is now recognised that properly-organised and equipped museums are valuable factors in education, and render good service in directing and stimulating scientific work. Unfortunately, owing to general lack of means, and a staff the members of which have not received sufficient training, provincial museums are often of no service to education or to science. In *Natural Science* (December 1897), Mr. Herbert Bolton refers to these museums, and points out that hardly any two can be said to work upon a common plan, whilst most develop and exist rather as the sport of circumstances than as the outcome of definite purpose and design. What is badly wanted is the creation of an annual museums' grant by Government in aid of provincial museums of University Colleges, and of large cities possessing good collections and a trained staff, the sum allotted to each being determined by considerations similar to those which guide the application of the present University Colleges' grant. Upon the strength of such a grant the Government could charge each museum with a definite scope of work and the attainment and retention of a certain standard of excellence. It is also suggested that other museums might be subsidised through the agency of Council Councils, upon certificates of efficiency and progress received annually from an accredited visitor, who might be an official of the Government or of one of the first-class museums, Mr. Bolton's scheme of classification of museums, and of the work these institutions might do, should assist in directing attention to an important subject.

M. J. DENIKER (*Bulletins de la Société d'Anthropologie de Paris*, 1897, fascicules 3 and 4), in a paper of considerable length, briefly mentions the characteristics of the inhabitants of the various districts of Europe. If three variants (cephalic index, measurement of stature, and colour of skin and hair) be each classified under three headings, twenty-seven combinations may result: as a matter of fact only six occur in considerable numbers, while four more in lesser numbers. The conclusion that only six primary races (excluding Turks, &c.) inhabit Europe, with four secondary, the latter in smaller numbers and probably due to mixtures of the primary. These races he characterises and names:

(1) Blond, dolichocephalic, very tall ...	North-western race.
(2) Blond, sub-dolichocephalic, short	Eastern race.
(3) Brown, very dolichocephalic, very short	Ibero insular.
(4) Brown, very brachycephalic, short	Western race.
(5) Brown, sub-dolichocephalic, tall..	Atlanto-Mediterranean.
(6) Brown, brachycephalic, tall ...	Adriatic.

The four secondary races:

(α) Blond, mesocephalic, tall ...	Eastern Prussia.
(β) Blond, mesocephalic, very short...	Sweden.
(γ) Medium, sub-dolichocephalic, tall	Ireland, Belgium.
(δ) Auburn, sub-brachycephalic, medium	Holland to Bavaria.

THE first number of a new volume of *The Naturalist*, that old-established and admirable little monthly journal of natural history for the north of England, marks the disappearance of its former slate-grey wrapper and the substitution of a pink one, together with sundry improvements in type and setting, and the introduction of paper better adapted for illustrations. Altogether the editors are to be congratulated on the changes they have brought about.

WE have received from Messrs. Carl Zeiss, of Jena, a catalogue of microscopes and one of photographic objectives. The former does not describe any new kind of instrument, but in the latter an interesting feature is the new "Planar" lens. It is claimed that, with this, objective enlargements can be obtained of microscopic sections up to 100 diameters, so that it should prove extremely useful to botanists and others whose preparations demand the use of a lens having a large field and great covering power.

THE additions to the Zoological Society's Gardens during the past week include a Dingo (*Canis dingo*, ♂) from Australia, presented by Mr. D. R. McDowall; a Long-legged Buzzard (*Buteo ferox*), a Kestrel (*Tinnunculus alaudarius*), captured in the Red Sea, presented by Mr. J. Kilpatrick; a Golden-naped Amazon ((*Chrysotis auripalliata*) from Central America, presented by Mr. Gambier Bolton; two Red Ground Doves (*Geotrygon montana*) from South America, presented by Lady Blake; a Dinker Bok (*Cephalophus grimmi*) from West Africa, presented by Mr. L. H. Nott; a Salvadore's Cassowary (*Casuarius salvadori*) from New Guinea, a Salvin's Amazon (*Chrysotis salvini*), a Blue and Yellow Macaw (*Ara araraurna*), a Red and Yellow Macaw (*Ara chloroptera*) from South America, deposited; two Black Larks (*Melanocorypha peltoniensis*) from Siberia, purchased; two Axis Deer (*Cervus axis*, ♀ ♀), a Pink-headed Duck (*Rhodonessa caryophyllacea*, ♂), an Indian Crow (*Corvus splendens*), four Spotted Turtle Doves (*Turtur suratensis*), two Brown-headed Gulls (*Larus brunneicephalus*) from India, received in exchange.

OUR ASTRONOMICAL COLUMN.

PLANETARY RELATIONS.—In *Comptes rendus*, of January 17, M. Emile Anceaux gives a note on the four great planets, and some new deductions relating to them. The four great planets—Jupiter, Saturn, Uranus, and Neptune—possess between them more than 99/100 of the known planetary mass; whilst Jupiter and Saturn alone have a total mass greater than 9/10 of this. It seems natural, then, to consider the system of these four planets as a world apart and independent of the other planets relatively small, and separated by a band of telescopic planets smaller still. The author considered, therefore, whether, by reason of their importance, the masses of the four great planets would not have some influence upon their distribution with respect to their distances from the sun. Some of the most interesting deductions are as follows:—

The masses of Jupiter and Saturn are inversely proportional to the squares of the major axes of their orbits.

The mass of Jupiter is to the sum of the masses of Uranus and Neptune as the inverse square of the major axis of Jupiter's orbit is to the sum of the inverse squares of the major axes of Uranus and Neptune.

The mass of Jupiter is to the sum of the masses of the four planets as the inverse square of Jupiter's major axis is to the sum of the inverse squares of the major axis of the four planets.

The mean moments of inertia of Jupiter and Saturn referred to the sun are equal to each other.

The mean acceleration of the solar attraction on Jupiter is to the sum of the mean accelerations produced upon Uranus and Neptune as the mass of Jupiter is to the sum of the masses of Uranus and Neptune.

The reason of this harmony may be in the conditions of stability of the system, or in the circumstances which prevailed at the formation of the planets. If this last cause be possible, the study of these relations would not fail to throw some light upon the cosmogony of the solar system.

U PEGASI AND SHORT-PERIOD VARIABLES.—The telescopic variable known as U Pegasi, which was discovered by Chandler in 1894, has for a long time been thought to have the shortest period of all variable stars, but observations made at the Harvard College Observatory go to prove that this is not the case.

Prof. Pickering, in *Circular* No. 23, from the above Observatory, gives the results of the observations made by Mr. O. C. Wendell with the polarising photometer, and states that the discrepancies between various observers, as to the period of the star, made it desirable to determine the true form of the light curve photometrically.

Mr. Wendell began his observations on December 28 of last year, using, as comparison, the star + 15°·4916, mag. 8·90, which is only 15′ distant. From 2784 settings of the photometer he constructed a light curve, from which it soon became evident that alternate rather than successive minima were alike; the magnitudes at principal and secondary minima being 9·90 and 9·75 respectively. The light curve thus drawn, closely resembles in form that of β Lyræ, having nearly equal maxima, with magnitudes of about 9·30, and a period of 8h. 59m. 41s., the secondary minimum occurring nearly midway between the two primaries.

This period, it will be seen, is considerably different from that of 5h. 32m. 15s., as given by Mr. Chandler; but Prof. Pickering points out that, taking either value, the phases recur at nearly the same times every three days. If we neglect the difference between the primary and secondary minima, reduce the half-period to fractions of a day, and multiply it by 16, we obtain the product 2·99824d., or very nearly three days. If we multiply the period 5h. 32m. 15s. by 13, we obtain 2·99948d., or very nearly the same quantity. Accepting this new result, it appears that U Pegasi is no longer the variable star having the shortest period known. This position appears to be held by the variable ω Centauri 19, discovered by Prof. Bailey, who finds its period to be 7h. 11m. Although U Pegasi can no longer be regarded as an example of that peculiar class of short-period variables, having a single maximum in which the decrease is more rapid than the increase, this class is still represented not only by S. Antliæ, but by ω Centauri 24, which Prof. Bailey finds to decrease twice as rapidly as it increases, while ω Centauri 45 increases at least five times as fast as it diminishes.

WINNECKE'S COMET, *a* 1898.—The ephemeris of this comet is continued in the *Astronomical Journal* (No. 425) from February 7 to March 31, but for the purpose of observation it will suffice to give positions as far as the end of February; for after then the comet will be too near the sun to be conveniently observed.

Ephemeris for Greenwich Midnight.

1898.	App. α			App. δ			log Δ
	h.	m.	s.	°	′	″	
Feb. 7·5	17	54	3·34	−12	1	18·5	0·1457
9·5	18	4	0·23		21	40·1	
11·5		14	2·88		40	49·7	0·1400
13·5		24	12·71	−12	58	42·2	
15·5		34	28·36	−13	15	12·5	0·1356
17·5		44	49·18		30	15·4	
19·5	18	55	14·35		43	47·1	0·1326
21·5	19	5	43·16	−13	55	43·1	
23·5		16	14·76	−14	6	0·8	0·1310
25·5		26	48·40		14	36·4	
27·5	19	37	23·22	−14	21	28·2	0·1307